FIRST RECORD OF PARASITISM BY A TICK ON AN AUSTRALIAN FRESHWATER CROCODILE. *Memoirs of the Queensland Museum 38(2):686. 1995*:- I report an uncommon occurrence of the tick, *Amblyomma* sp., after encountering a nymph on a yearling freshwater crocodile, *Crocodylus johnstoni*. Although leeches and dermal nematodes are common ectoparasites on this crocodile (Webb et al. 1983), this is the first record of tick parasitism on any Australian crocodile.

The crocodile was captured during an ongoing study of *C. johnstoni* in the Lynd River of north central Queensland (Tucker et al., 1994). The crocodile (#3057) was marked as a hatchling on 18 December 1993 and recaptured on 30 November 1994, approx. 3.8km upstream from the original nest site. The recapture site was 0.1km upstream from an area known locally as the "Croc Hole" (near 144° 20'W, 17°45'S). The crocodile was initially resting on a sandy bank, entered the water and was then caught within a shallow pool. It was emaciated and its length (19.7cm snout-vent length) and mass (120g) were below average in comparison to conspecifics of the same age (mean length =23.5cm, SD = 3.2cm, n = 100; mean mass = 260g, SD = 110g, n = 92). From the crocodile's neck, I removed a nymphal tick which was placed into a vial of ethanol. The tick was identified at the Department of Parasitology, University of Queensland and the specimen deposited in the Queensland Musuem (QMS26190, U.Q. Parasitology reference B398). Given the limitations of existing taxonomic keys, it is difficult to positively identify any nymphal tick beyond the genus level. However, the distribution records for tick specimens in the Queensland Museum strongly suggest either *Amb. limbatum* or *Amb. moreliae*.

No ticks are known to be obligate ectoparasites of crocodiles (J. Keirans, pers. comm.) and there are few published records of ticks found on crocodiles. Neuman (1899) recorded *Amblyomma ? grossum* (Pallas) on crocodiles in Surinam but the identity of the tick is questionable. *Aponomma exornatum* have been recorded on a crocodile (probably *C. niloticus*) in the Congo (Schwetz, 1927), on *C. niloticus* in Uganda (Matthysee & Colbo, 1987) and in Mali (Villiers, 1995). These records likely resulted from a crocodile preying upon a tick-infested animal or by transferral of a tick from another reptilian host. The latter source is more probably given the high frequency of tick infestations recorded on *Varanus niloticus* from the same regions in Africa.

Over 100 species of *Amblyomma* exist worldwide and the life histories of well known species indicate they are three-host ticks (Roberts, 1970). Six Australian ticks are common ectoparasites of reptiles (*Amb. albolimbatum, Amb. moreliae, Amb. limbatum, Amb. calabyi, Ap. fibriatum* and *Ap. hydrosauri*) (Roberts, 1970; Heatwole & Pianka, 1993) and a complete host-parasite list appears in Roberts (1970). Two newly described species, *Amb. glaueri* and *Ap. glebopalma*, were added recently for varanid lizards (Keirans et al., 1994). Although a few semi-aquatic hosts have been recorded, including two chelid turtles and a water dragon, reptilian hosts of ticks are predominantly from arid terrestrial habitats.

Distribution records of reptilian hosts for this tick genus (Queensland Museum, unpubl. data) include many large snakes and lizards with ranges that overlap the study site, particularly Eastern brown snakes (*Pseudonaja textilis*), carpet pythons (*Morelia spilota variegata*), and sand goannas (*V. gouldii*; Cogger, 1992), although other undocumented hosts cannot be excluded. Goanna tracks are common on the sandy flood plain at the study site and their trails cross the river near the capture location (A. Tucker, pers. obs.). Although previous herpetofaunal surveys of this region indicated a decline in their numbers (QDEH, unpubl. data), recent observations confirm that goannas are at least locally abundant near Frenchy's Crossing (0.7km upstream of the recapture location). It cannot be verified that the tick was transferred from these or other potential hosts but the tick certainly attached during a terrestrial emergence by the crocodile, as hard ticks do not occur on wholly aquatic vertebrates. Freshwater crocodiles emerge mainly to bask, or nest, but sometimes move overland during the dry season. Parasite transferal by ingestion of a tick-infested host is unlikely as the diet of yearling *C. johnstoni* includes no vertebrates other than tiny frogs. This host-parasite relationship is undoubtedly rare since this represents the only occurrence noted in over 3300 crocodiles examined individually for ectoparasites during the study.

Although the evidence is circumstantial, it appears likely that a local goanna population serves as a preferred host for the tick. Large lizards can easily serve as potential vectors since tropical teiids or varanids are commonly parasited by ticks and often found near habitats used by crocodilians. It is reasonable to presume that tick-parasitism of crocodiles probably resulted from indirect transferral from a reptilian host rather than through direct ingestion of parasitised prey. In either case, the occurrence of tick parasitism on crocodiles remains highly infrequent.

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Literature Cited

Cogger, H.G. 1992. Reptiles and Amphibians of Australia (Reed Press: Sydney).

Heatwole, H. & Pianka, E.R. 1993. Natural history of the Squamata. Pp.197-209. In Glasby, C.J., Ross, G.J.B. & Beesley, P.L. (eds.) Fauna of Australia, vol.2a, Amphibia and Reptilia (Australian Government Publishing Service: Canberra).

Keirans, J.E., King, D.R. & Sharrad, R.D. 1994. *Aponomma (Bothriocroton) glebopalma*, n. subgen., n. sp., and *Amblyomma glaueri* n. sp. (Acari: Ixodida: Ixodidae), parasites of monitor lizards (Varanidae) in Australia. Journal of Medical Entomology 31:132-147.

Matthysee, J.G. & Colbo, M.H. 1987. The Ixodid Ticks of Uganda (Entomological Society of America: College Park, Maryland).

Neumann, L.G. 1899. Révision de la famille des Ixodedés. Mémoires de la Société Zoologique 12: 107-297.

Roberts, F.H.S. 1970. Australian ticks (Commonwealth Scientific and Industrial Research Organisation: Australia).

Schwetz, J. 1927. Contribution à l'étude de Ixodidae (tiques) du Conge belge. Revue Zoologique Africaine 15: 73-80.

Tucker, A.D., McCallum, H.I., Limpus, C.J. & McDonald, K.R. 1994. *Crocodylus johnstoni* in the Lynd River, Queensland: continuation of a long term field study. Pp. 469-473. In Proc. 2nd Regional Meeting of the Crocodile Specialist Group. IUCN, Gland Switzerland.

Villiers, A. 1955. Note sur quelques Ixodidae et Gamasidae parasites de vertébrés rencontrés en Afrique Occidentale Francais. Bulleting de l'Institut francaise d'Afrique Noire 17A: 444-454.

Webb, G.J.W. & Manolis, S.C. 1983. *Crocodylus johnstoni* in the McKinlay River Area, Northern Territory. V. Abnormalities and injuries. Australian Wildlife Research 10: 407-420.

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